

## Reconstruction of the Cheek

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**Learning Objectives:** After studying this article, the participant should be able to: 1. Describe the cheek unit and its specific requirements for quality, outline, and contour. 2. Identify factors involving the patient, wound, and donor materials that determine technique. 3. Understand the application of anteriorly based, posteriorly based, and advancement flaps, and the use of serial excisions for specific defects. 4. Identify, prevent, and treat complications of cheek reconstruction.

The face can be divided into adjacent topographic areas of characteristic skin quality (color, texture, hair-bearing), outline, and contour, that define its regional units.<sup>1</sup> The skin quality of the cheek matches the face in color and texture and is normally covered by a fine matte hair in women and a beard pattern that continues into the sideburn in men. The peripheral outline of the cheek unit is formed by the hard and soft-tissue contours of the bordering units (forehead, eyelids, nose, lips, neck, and ear). Its outline follows the preauricular contours of the tragus and helix; goes around the sideburn, across the zygomatic arch (abutting the slight hollow of the temporal fossa), and into the lower lid-cheek junction; and then passes inferiorly along the nasal sidewall into the nasolabial fold and marionette line (abutting the upper and lower lip units), around the chin and toward the submental crease. It then extends laterally along the jawline, passing superiorly up the angle of the jaw and back to the ear. In contour, the cheek is a relatively flat, expansive surface, except for the soft roundness of the nasolabial folds and cheek prominences. Time, sun injury, and ptosis create the typical alterations in cheek contour associated with aging.

The reconstructed demands of any single unit vary according to the defect and its unit characteristics and priority. Central facial units (nose, lip, eyelid) are complexly and subtly contoured. They are seen in primary gaze, and their contralateral normal subunit (opposite ala, eyelid, lateral upper lip) are available for

visual comparison in almost all views. They are fixed units and have the highest priority in reconstruction. Any unexpected alteration of size, shape, character, or symmetry will be obvious and distracting and will indicate that “this face is broken.” In contrast, the units of the facial periphery (cheek and forehead) are like a picture frame, and they are of secondary importance. The cheek is flat, expansive, and uninteresting. Its dimensions and outlines are variable. Its borders are not fixed but rather change from person to person and with age, sex, hairline position, hairstyle, and expression. The outline of the contralateral cheek cannot be fully compared with the other cheek in any view. Exact symmetry, especially of outline, is not vital.

The preoperative plan should distinguish between central and peripheral features with regard to guidelines for unit reconstruction. For example, when filling a nasal defect (a central unit), the following rules are recommended<sup>2</sup>:

1. Rebuild or resurface entire units; do not fill defects.
2. Alter the wound in site, size, and outline.
3. Discard adjacent normal tissue within units and subunits to improve the final result.
4. Use the contralateral normal as a guide.
5. Use exact templates to design flaps and grafts to replace missing tissue in precise outline and dimension.

These rules of central regional unit reconstruction ensure uniform skin quality, position

scars at the periphery of units so that they are hidden in the joins between them, and harness centripetal wound contraction to reestablish a convex subunit contour. These principles are less appropriate in the reconstruction of a peripheral unit, such as the cheek.

Cheek defects are filled by sharing tissue from adjacent units (neck, submental area, chest), not by replacing them exactly with interpolating flaps, as a nasal tip defect might be with a forehead flap. It is impractical and unnecessary to excise all adjacent normal tissue within the large cheek unit.

In peripheral units such as the forehead and cheek, the most important element in restoring normal facial surface appearance is uniformity of skin color and texture, not contour or outline. In the cheek, as Feldman<sup>3</sup> has pointed out in facial burn resurfacing, uniformity of skin color and texture is vital to the restoration of the normal facial appearance. When treating subtotal facial scarring, skin grafts are avoided, because they produce a patched appearance owing to their unpredictable color and shiny texture match where they abut normal facial skin. Local and regional flaps are the first choice. For total facial resurfacing, either a complete skin graft or a complete flap are options. Combinations of grafts and flaps are not aesthetic.

Skin quality also guides the use of distant microvascular tissues in cheek reconstruction.<sup>4</sup> Large, deep, and compromised wounds are often filled with distant tissue, usually by microvascular transfer. Although available, highly vascular, and able to repair complex wounds, distant skin is a poor-quality match for facial skin. When an aesthetic appearance is important, local, and regional tissues are required for resurfacing the cheek. Distant tissues should be used only for what they do best—supply “hidden” lining and bulk, and revascularize difficult wounds (contaminated, ischemic, radiated)—not permanently resurface the face. Local and regional flaps should be advanced secondarily to provide permanent external skin after other, deeper soft-tissue needs are supplied by distant tissues.

Although scars are best placed in the joins between units or hidden along the hairline or contour lines, the presence and position of facial scarring are less important in a peripheral unit. However, Zide<sup>5</sup> has pointed out that vertical incisions anterior to a line drawn from the lateral canthus are best avoided in the cen-

tral face. Such scars are distracting when visible on direct frontal view. Flap incisions and dog-ear excisions are best hidden in blepharoplasty-type incisions or positioned directly in the nasolabial fold, rather than vertically across the zygomatic eminence.

Many cheek defects also extend into adjacent units—scalp, eyelid, nose, lips, or chin. Normal residual landmarks, if distorted by wound tension, gravity, or contraction, must first be positioned back to normal. Preservation of lower lid position and oral function are priorities and may require an upper-lid Tripiet skin-orbicularis flap or lip switch flap as a first step.

Surgeons tend to place a single flap into a single wound during a single operation. However, reconstruction in stages may be best. When a nasal defect accompanies a significant lip and cheek defect, only the lip and cheek should be reconstructed primarily.<sup>2</sup> The nose should be repaired secondarily after a stable cheek platform is ensured. If the lip, cheek, and ala are reconstructed simultaneously, subsequent wound settling distorts the position of the ala. Wound contraction and gravity shift the lip and the cheek platform, dragging the reconstructed nose inferiorly and laterally.

A defect of both cheek and hair-bearing scalp or sideburn should be reconstructed with the appropriate materials. To restore both the cheek and scalp units, scalp rotation flaps or superiorly based transposition hair-bearing flaps should be positioned to reestablish the position of the hairline, based on the template of the contralateral normal hairline outline.

#### PLANNING

Thoughtful consideration of the patient, wound, and available donor material is helpful to identify the most appropriate technique.

#### THE PATIENT

Most patients want to be restored to their normal appearance before injury or surgery. Most are grateful to the surgeon who provides information and options and is committed to achieving a result that fits their goal.

In general, the difference between male and female patients is overemphasized. However, when planning cheek flaps in the child or male adult patient, the position of facial hair must be considered. Beard or sideburn areas should lie only where normally expected. The absence of a beard pattern is equally distracting. The

male beard pattern must be realigned to the sideburn.

Skin laxity associated with aging can be used to advantage. Interestingly, preadolescent children seem to have exceptionally elastic skin, which can be undermined widely, permitting significantly greater flap stretch than expected. In any patient, preexisting scars, deformity due to previous surgery or trauma, or the risk of subsequent primary cancers will alter the reconstruction. Other medical illnesses may preclude a complicated reconstruction.

#### DEFECT

##### *Site*

The site of the cheek defect influences the direction of skin-flap motion, pedicle base location, and risks to the adjacent and underlying structures. Small-to-moderate defects in the anterior cheek are repaired with posteriorly based rotation advancement flaps. Posterior or large anterior defects are resurfaced with anteriorly based rotation advancement flaps, or the "hike" advancement flap. A low horizontal defect may be covered by cervical advancement.

In the preauricular area, the facial nerve is protected to the anterior border of the parotid. More anteriorly, the parotid duct and seventh nerve are at risk. Scar contracture and the need for secondary Z-plasty or W-plasty increase if a scar crosses the mandibular border into the neck.

##### *Size*

Unexpected wound contraction may occur in areas of burn scarring or past excisions, creating a defect larger than would be apparent before returning normal areas to their normal appearance. Smaller defects may be repaired by primary closure or local flaps, but most defects greater than 30 percent of the cheek unit will require recruitment of residual cheek and neck skin as large rotation or advancement flaps. As in scalp reconstruction, a larger flap permits easier advancement and later secondary re-advancement.

##### *Shape*

Although often circular, most defects will be converted to an ellipse or triangular excision to correct dog-ears created by flap shifts. Most vertically oriented defects will be closed by a rotation advancement, and horizontal wounds by superior advancement. The position of fu-

ture dog-ear excisions should be considered during planning, and hidden in contour lines, if possible.

##### *Depth*

The deeper the wound, the greater the risk to the facial nerve, and the greater the requirement for soft-tissue bulk or oral lining. Cheek contour is best restored by resupplying the appropriate amount of skin and underlying soft tissue. Although a skin and superficial subcutaneous random skin flap is ideal to cover a superficial wound, deeper excisions are best resurfaced with thicker and better-vascularized deep-plane cheek techniques. However, a thicker composite flap will require substantial thinning if it is advanced to cover the adjacent lower lid or nasal sidewall unit. Isolated bulk losses in the medial cheek are often associated with adjacent nasal and lip defects. Medial soft tissues can be replaced with the Millard fat flip-flap.<sup>6</sup> After cheek flap elevation, residual subcutaneous fat lateral to the defect is hinged over on a subcutaneous pedicle to fill the medial cheek soft-tissue loss, and then covered with the advancing cheek flap. Secondary contour defects that follow deep soft-tissue excisions can be filled by fat injection,<sup>7</sup> dermal fat grafts,<sup>8,9</sup> or deepithelialized pedicle or free flaps. Lining will be needed only in the central cheek, which is not protected by the underlying zygoma, maxilla, or mandible. Most are closed primarily or with small local flaps. Large lining defects require a second regional flap or a microvascular free flap.

##### *Wound Condition*

A highly contaminated or infected wound, or a high-velocity or avulsion injury, may require delayed primary reconstruction after serial debridement, dressing care, or temporary split-thickness skin grafting. Old radiation injury limits the use of local tissues because of decreased vascularity, atrophy, and poor wound healing. Autoimmune diseases (e.g., Romberg's) must be quiescent. Old traumatic injury or burns, or previous skin cancer reconstruction, may affect the timing, donor choices, and methods of repair.

##### *Etiology*

After cancer excision, clear margins must be ensured before a definitive repair. Options include routine intraoperative frozen sections, Mohs' micrographic excision, or permanent

histologic sections. This is especially problematic after melanoma-in-situ excision, in which frozen section examination is not reliable. Preoperative Wood's light examination of the clinical lesion, followed by excision and delayed primary repair after the permanent margins are evaluated, are often indicated.<sup>5</sup> If primary repair is to be performed, a large rotation flap that permits further excision and re-advancement is indicated, in case initial frozen section margins are found to be positive on permanent examination.

#### Associated Injury

Injury to adjacent units increases the risk of distortion to adjacent landmarks and complexity. Careful planning is required and may necessitate a staged reconstruction to ensure a stable platform and the restoration of lid and lip sphincter function. If planned preoperatively, available excess tissue within a dog-ear can be used secondarily as an advancement or transposition flap to resurface adjacent units, or the entire flap may be re-advanced. Medial dog-ears present after anteriorly based rotation advancements can be re-advanced as a V-Y flap to supply skin to the lower lid<sup>10</sup> or cut out as a transposition flap to resurface the lateral and medial upper lip units. A midline advancement flap used to resurface a lower cheek defect can be designed to simultaneously resurface an adjacent chin or lower lip defect.

#### THE DONOR SITE

The very small amount of excess skin available transversely across the face from the ear to the lateral canthus is rigidly fixed by retaining ligaments extending from the periosteum and fixed deep structures to the skin. The standard diagram is deceptive in its illustration of a large cheek defect closed with a small, anteriorly based rotation advancement flap designed with an incision across the cheek to the preauricular area, ending in a small back-cut below the ear (Fig. 1, *above, left*).

The only significant areas of excess skin are located in the jowl, which can be shifted superiorly using a posteriorly based flap, or in the adjacent lateral neck and chest, which can be moved as an anteriorly based flap. Donor skin is transferred from the areas of availability because of the inherent elasticity of the extensile neck and shoulder and the ability to temporarily efface the cervical and clavicular hollows by undermining.

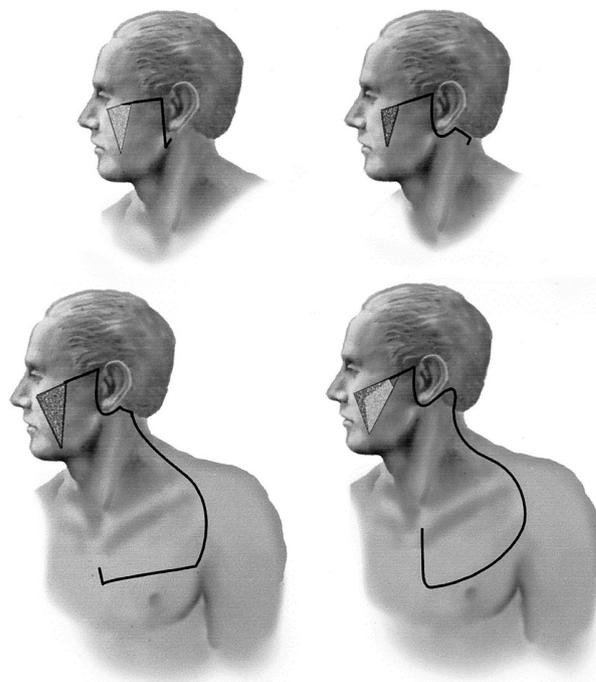


FIG. 1. Anteriorly based rotation advancement flaps: an extensile approach. Posterior and anterior defects can be closed with anteriorly based rotation flaps designed to share skin from the cheek, neck, and anterior chest. Their design is determined by the size of the defect and the adjacent skin laxity. (*Above, left*) Because little excess skin is available across the cheek transversely from the ear to the lateral canthus, the standard diagram illustrating a small rotation advancement flap limited to the preauricular area is ineffective. It does not provide enough skin to close both the donor and recipient sites. (*Above, right*) Juri and Juri's<sup>11,12</sup> cheek flap passes around the ear to follow the occipital hairline. Neck and residual cheek skin is undermined subcutaneously and rotated superiorly and anteriorly. (*Below, left*) For larger defects, the incision continues from the occipital hairline, down across the neck, and into the anterior chest, passing 2 to 3 cm above the nipple-areola complex to the parasternal area. (*Below, right*) For burn reconstruction, Feldman<sup>3,16</sup> continues the cervicopectoral incision upward along the lateral border of the sternum to the manubrium.

Larger flaps, by sharing the donor burden, allow easier closure and permit later re-elevation and advancement if necessary. An "extensile" approach allows the design of the flap incision to proceed from the cheek into the neck and chest in a cut-as-you-go fashion, with progressive release and undermining until tension-free recipient closure is possible. The donor site is closed by primary repair, V-Y advancement, shifting contralateral neck skin, a temporary skin graft with later excisions, or initial or secondary expansion.

#### TECHNIQUES

Many cheek defects can be repaired by primary closure along resting skin tension or con-

tour lines. The occasional small or superficial defect at a distance from more mobile central features can be allowed to heal secondarily, especially in the patient with irregularly pigmented, sun-injured skin, in which an atrophic, shiny scar will blend satisfactorily. Significant cheek defects are repaired with regional flaps that shift residual cheek and cervical skin to the face, after releasing the deep retaining ligaments that normally fix facial skin to deeper, immobile fasciae and periosteum.

### *Incision Design*

*Anteriorly based rotation advancement flaps.* Useful for posterior and large anterior defects, anteriorly based rotation advancement flaps are designed to transfer skin from the cheek, neck, and anterior chest, as determined by the size of the defect and the laxity of the adjacent skin. The incision passes transversely from the superior aspect of the defect, around or through the sideburn, inferiorly in the preauricular crease, and then about the earlobe to follow the occipital hairline, with or without a back-cut inferiorly (Fig. 1, *above, right*). Juri and Juri<sup>11,12</sup> elevate the flap in the subcutaneous plane to the clavicle and shift the residual cheek skin forward on an anterior vascular base supplied by the facial and submental arteries. The neck advances upward to close the donor site. The dog-ear is removed as a triangular excision in the anterior cheek, ideally, in the nasolabial fold.

For larger defects of up to 6 to 10 cm, the incision can be "extended" as a cervicopectoral flap, which moves neck and chest skin to the face. Described by Crow and Crow,<sup>13</sup> Becker,<sup>14</sup> and Shestak et al.,<sup>15</sup> the flap incision is simply extended from the hairline down into the neck, several centimeters behind the anterior border of the trapezius muscle (to avoid late scar webbing), passing lateral to the acromioclavicular joint and deltopectoral groove following the lateral pectoral border, and, finally, crossing the chest medially, parallel to the clavicle, 2 to 3 cm above the nipple-areola complex in the male patient (third to fourth intercostal space) (Fig. 1, *below, left*). The flap is elevated with platysmal muscle and with deltoid and pectoral fasciae. A back-cut can be made in the parasternal area. The blood supply is maintained through internal mammary perforators of the pectoralis muscle. Simultaneous parotidectomy and radical neck dissection can be performed. Scars are favorably positioned along contour lines and in the hairline.

All of these anteriorly based anterior advancement flaps are one-stage procedures. They are designed to (1) place the temple aspect of the suture line on a plane between or above the lateral canthus and helical root to support the cheek and eyelid; and (2) resurface the cheek, lower lid, and temple. The donor sites are closed primarily or as a V-Y. Anterior dog-ears are excised primarily or secondarily, depending on the risk to the flap blood supply and later secondary tissue requirements. To avoid excess tension, those parts of the donor excision in less visible areas can be allowed to heal secondarily or by temporary skin graft, with later scar revision or graft excision performed as necessary.

To resurface very large areas of the cheek in facial burns, Feldman<sup>16</sup> continues the cervicopectoral incision superiorly along the lateral edge of the sternum and up to the manubrium (Fig. 1, *below, right*). This shifts the pivot point of the flap up to the suprasternal notch. This thin, random skin and subcutaneous flap is first delayed by incising its outline, ligating the deltopectoral and thoracoacromial perforators over the lateral shoulder, and elevating the neck in stages during four to five subsequent operations. When rotated, the pedicle blood supply is based in the neck, not the chest. The donor defect is limited to the chest alone, and it can be skin-grafted and later excised in stages or with expanders.

*Posteriorly based rotation advancement flaps.* Used for small and moderate-sized anterior cheek defects, a posteriorly based flap transfers the excess skin of the inferior face, jowl, and submental areas along an incision that follows the nasolabial fold to the commissure and can continue to or across the jawline and anteriorly into the submental crease, ending with a back-cut (Fig. 2, *left*). Kaplan and Goldwyn,<sup>17</sup> Stark and Kaplan,<sup>18</sup> and Beare<sup>19</sup> extend the incision inferiorly into the neck, toward the midline, to the middle or lower parts of the neck and then transversely toward the sternocleidomastoid muscle, roughly paralleling the mandibular border, and, finally, superiorly and posteriorly toward the earlobe or mastoid (Fig. 2, *center*). For even larger defects, Garrett et al.<sup>20</sup> continue the vertical midline incision inferiorly along the sternum and then sweep laterally down across the chest, above the nipple-areola complex and toward the axilla (Fig. 2, *right*). These subcutaneous flaps are vascularized in the face from the superficial temporal artery and vessels in the preauricular region, in the neck from the verte-

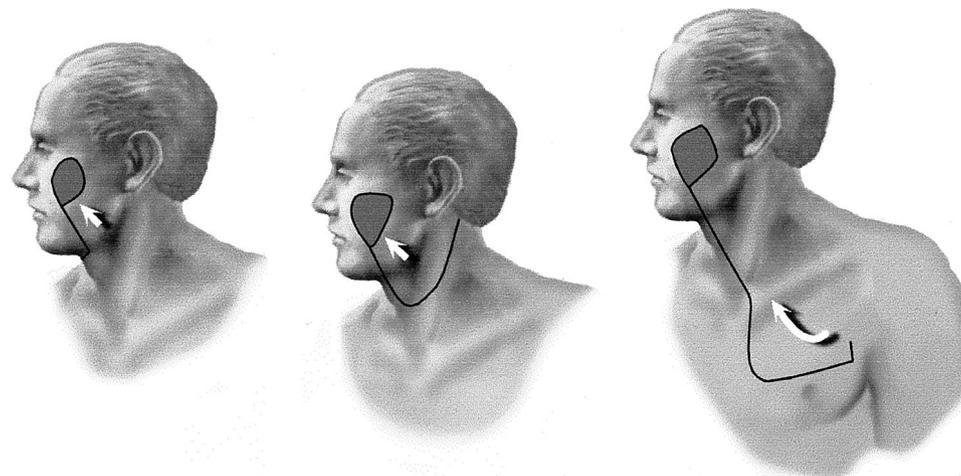


FIG. 2. Posteriorly based rotation advancement flaps. (*Left*) Posteriorly based rotation advancement flaps move excess skin from the jowl and neck to the cheek. An incision extends from the defect, follows in or parallel to the nasolabial fold past the oral commissure, and can continue to or across the jawline, passing anteriorly into the submental crease as a back-cut. (*Center*) The incision can be extended inferiorly into the middle or lower neck toward the midline and then continue toward the sternocleidomastoid muscle and upward toward the earlobe or mastoid. (*Right*) For very large defects, the vertical midline incision can continue inferiorly across the sternum and sweep laterally across the chest, above the nipple-areola complex, toward the axilla.

bral and occipital arteries, and in the chest from the perforators of the trapezius muscle and thoracoacromial vessels, depending on the design of the flap. The platysmal muscle may or may not be included.

In all posterior-based flaps, undermining should stop at least several centimeters anterior to the ear. These flaps are not delayed. Simultaneous parotidectomy and neck dissection is reported to be safe. The tip of the advancement flap may reach the medial canthal area or nasal sidewall, but the flap will not easily resurface the lower lid. The donor site is closed primarily, as a V-Y advancement, from the skin of the opposite neck or, occasionally, with a cervical skin graft. A Z-plasty may be needed secondarily if the scar crosses the mandibular border. The posteriorly based rotation advancement flap is most often used for small medial cheek defects and permits relatively easy transfer of excess nasolabial and jowl skin and subcutaneous fat to defects abutting the lip and nose.

#### *Flap Blood Supply*

The major drawback of an extensively mobilized random cervical facial flap is its unpredictable blood supply. The risk of necrosis is especially high in smokers, in large wounds under tense closure, and in patients with a history of irradiation. First described by Barton and Zilmer<sup>21</sup> and popularized by Kroll et al.,<sup>10</sup>

the blood supply to anteriorly based cervical facial flaps can be improved by elevating the flap in a deep plane [below the superficial musculoaponeurotic system (SMAS) and platysmal muscle], as in the modern composite face lift.<sup>22</sup> A standard cervicofacial flap is incised, but after a short subcutaneous dissection it shifts 2 cm anterior to the tragus under the parotid fascia and the SMAS, passing inferiorly into the neck under the platysmal muscle. The subfascial dissection is simplified by the wide exposure permitted by the defect and lengthy incision. Because the flap includes the cheek fat, SMAS, and platysma muscle, the blood supply is augmented. Flap reliability and ability to handle tension are increased. Careful dissection anterior to the parotid and over the mandibular border minimizes risk to the seventh nerve.

*Advancement flaps.* The vertical "hike" deep-plane cheek flap<sup>23</sup> was developed by Zide to avoid the predictably located, vertically oriented dog-ear created by the standard rotation advancement flap. Using a shortened preauricular incision that rarely must be extended past the earlobe, the dissection goes deep to the subcutaneous tissue and SMAS. The lateral body of the orbicularis oculi muscle is identified, and the soft tissues are cleared off the zygomatic major muscle, releasing zygomatic retaining ligaments.

Upward skin mobility permits the vertically

advanced flap to be secured to the periosteum of the lateral orbital rim and anterior zygomatic arch. The resulting horizontal dog-ear is excised simultaneously, within lower lid and/or upper lid blepharoplasty incisions. The vertical shift hides scars cosmetically in the sideburn or eyelid incisions, prevents anterior malposition of the sideburn and beard, and avoids a vertical dog-ear over the zygomatic prominence. The deep-plane "hike" flap is especially applicable to defects located over the lateral zygoma, lower lid, and temple.

*The split ascending neck flap.* The split ascending neck flap was described by Grishkevich and Ostrovsky<sup>24</sup> for facial burns. Healthy neck and chest wall skin is advanced superiorly to resurface a horizontally oriented defect along the mandible and lower cheek. Through the defect, the neck is widely undermined as a thin skin and subcutaneous flap on one or both sides of the neck and across the midline (Fig. 3). Muscle perforators are preserved over the midportion of the sternocleidomastoid muscle. The dissection extends 6 to 8 cm below the clavicle into the chest, releasing all attachments to the clavicle and sternum. This thin, elastic flap can be advanced up to 6 cm superiorly to cover the lower cheek and chin. It can be split to resurface the lower lip. No delay is required. A rectangular retroauricular skin extension can be included laterally to increase preauricular and temple coverage. To increase mobility and decrease soft-tissue bulk, the platysmal muscle is not included in the flap. Six to 12 months later, a second-stage advancement can be performed, re-advancing the

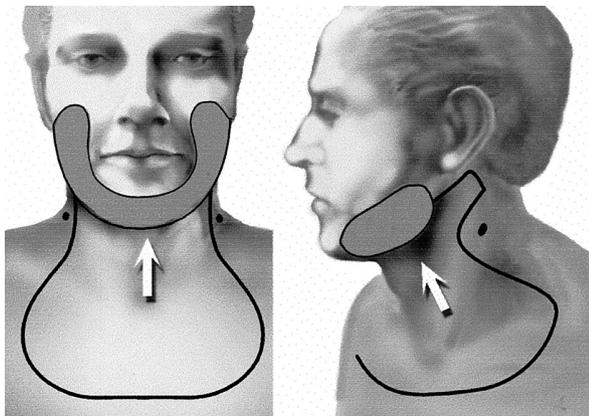


FIG. 3. The split-ascending neck flap. Healthy neck and chest wall skin can be advanced superiorly after extensive undermining, inferior to the clavicle. This flap is used to resurface horizontally oriented defects above the mandible and into the lower cheek. Muscle perforators over the midportion of the sternocleidomastoid muscle are preserved.

flap to the superior cheek and infraorbital area, and to the chin and lips if needed.

*Which flap?* Flap choice depends on the site, size, shape, and depth of the defect; patient risk factors such as age, associated disease, old injury, or smoking; and size, location, and elasticity of the available donor materials. These factors will affect incision length, pedicle base, level of dissection, and the appropriate donor.

#### *Random Skin Subcutaneous Flaps*

Although inherently less vascular and prone to tip necrosis, a thin-skin subcutaneous flap can be elevated rapidly without great risk to the seventh nerve. This flap is useful for smaller superficial defects that can be closed without significant tension in a patient at low risk for ischemic problems (nonsmoker, no small vessel disease due to diabetes, radiation, or autoimmune disease).

#### *The Deep-Plane Composite Flap*

The inclusion of deeper subcutaneous fat and myofascial layers augments the blood supply, creating a thicker, more vascularized flap that, elevated on a smaller pedicle base, may be more mobile. This flap can be sutured under moderate tension. It is ideal for larger, deeper complex defects, especially in the high-risk patient. However, the difficulty of dissection, risk of seventh nerve injury, and operating time are increased. This thicker flap must be thinned if applied to the lower lid or nasal sidewall.

#### *Serial Excision and Skin Expansion*

Skin expanders increase the available surface area of a donor site, and by moving the tissue as an advancement flap rather than a transposition flap, they minimize the number of new scars.<sup>25</sup> One or more subcutaneous expanders are normally positioned over the platysma through an insertion incision perpendicular to the defect. Then, cervical skin, over-expanded by 30 to 50 percent more than measurements might suggest, can be advanced to the cheek. The underlying scar capsule is excised or scored. Although complications are frequent, the final result is usually satisfactory.

Generating an expanded flap takes at least two procedures: one to insert and another to remove and advance the flap. Often, a third operation to adjust flap position and revise scars is needed. In reality, the length and position of subsequent facial scars are often similar to those needed for a transposition flap,

because the expanded skin requires peripheral advancement and rotation incisions to allow the flap to ascend onto the cheek. Expanded tissues are also inherently less elastic and have a tendency to retract.

In burn resurfacing, staged partial excisions with stepwise flap resurfacing of the cheek are alternative options. Feldman<sup>3,16</sup> uses several variations based on the site, size, and position of the defect and on the size and elasticity of the donor site.

Skin receives its blood supply vertically from perpendicular myocutaneous perforators and horizontally (circumferentially) from the subdermal plexus; skin will survive on either blood supply. If the vertical perforators are severed by extensive undermining, extensive circumscribing peripheral incisions should be avoided. Conversely, if more transposition than flap advancement is needed, undermining must be limited because peripheral incisions will divide the horizontal blood supply.

Using these principles, if unscarred local cervical skin is present, serial excision techniques can allow resurfacing of large superior cheek defects. If a secondary burn defect can be completely excised in two stages, serial excisions are performed in "rapid sequence," with repeat wide peripheral undermining of the advancement flap performed at 2 weeks. If more than two stages will be needed, a repeat partial excision is done, with re-advancement every 3 to 6 months ("slow sequence"). However, if a large cheek defect extends to or below the jawline, serial excision alone is adequate and preliminary skin expansion of the neck is performed to increase the available donor skin before flap advancement.

#### USE OF DISTANT TISSUES

Often, undamaged or minimally scarred skin remains in the chest, shoulder, or back when local facial and neck skin is unavailable. Several options exist. To transfer these distant tissues, they can first be expanded.<sup>3</sup> The augmented blood supply that results from the expansion process permits their transfer to the neck and face on a narrow pedicle of expanded skin. In other cases, a random-pattern direct tube pedicle can be used.<sup>16</sup> The donor site is delayed by partial circumferential incisions and is undermined in stages. The divided pedicle can later be unfolded at the time of division and used to resurface additional parts of the defect. These techniques allow the site of the transferred skin

tissue to be determined by the surgeon rather than by the vascular anatomy of the region. Unlike a direct cutaneous axial flap or other microvascular free flap, these distant sites are not restricted to those few places where cutaneous vessels are found.

Distant tissue has also been transferred by neovascularizing distant tissues, creating prefabricated flaps.<sup>26</sup> A vascular pedicle and/or fascia and muscle is elevated, shifted, and buried under an area of distant skin. Several weeks later, with or without preliminary skin expansion, the tissues are transferred on the vascular pedicle or microvascularly. Such techniques may allow the movement of thinner tissues of more ideal quality than "normal" flaps might permit.

Microvascular flaps are usually reserved for very large composite defects, especially those through-and-through the cheek. The radial forearm free flap, scapular flap, and groin flap are common choices.

#### COMPLICATIONS OF CHEEK RECONSTRUCTION

##### *Flap Necrosis*

Tissue survival depends on adequate vascularization and the avoidance of excessive or linear tension. A preoperative evaluation of the ischemic risk, based on the size of the defect and the associated donor laxity, may suggest augmentation of the blood supply by including the deeper myofascial elements in a deep-plane dissection.

##### *Lower Lid Edema and Scleral Show/Ectropion*

Cheek defects adjacent to the mobile lower lid may cause its displacement because of edema, gravity, or flap tension. This is most common in the aged lid or in one in which the orbicularis oculi fibers are denervated. This complication is best avoided. Lid support can be augmented by canthopexy at the time of surgery. Although the superior border of the cheek flap can be positioned along the subciliary margin, it is often more aesthetic and safer to rebuild the lower lid separately with a Tripiet flap from the upper lid.

When appropriate, cheek flap design should include a high lateral arc so that the lateral superior border of the flap is above the lateral canthal-helical root plane, suspending the flap higher than the lid margin.

A cheek flap should be overcorrected and the tension should be minimized. Very importantly, the flap should be sutured on its deep

surface to fixed deep underlying structures. Laterally, the flap can be suspended with sutures to the periosteum of the lateral and inferior orbital rim. Temporal facial nerve branches are not present over the zygomatic arch and zygoma more than 3.5 cm anterior to the external auditory canal.<sup>23</sup> This permits the safe fixation of the flap with permanent suture in an overcorrected position. The deepithelialized tip of a posteriorly based cheek flap can be fixed permanently to the medial canthal tendon. A temporary tarsorrhaphy and postoperative lower lid massage can minimize retraction.

To minimize prolonged lower lid edema, a greater than 1-cm skin muscle bridge should remain below the lateral canthus after cheek repair, if possible. Massage, time, and late subcutaneous debulking can help.

#### *Abnormal Hair Distribution*

Glabrous skin should not exist within the male beard pattern, nor should the male beard pattern or sideburn be displaced anteriorly in an abnormal position. This is best avoided by preoperative planning. The vertical "hike" flap avoids the anterior sideburn displacement seen after an anteriorly based rotation advancement flap.

#### *Inappropriate Soft-Tissue Replacement*

Ideally, preoperative planning allows the replacement of missing tissue in the correct thickness. If necessary, intraoperative thinning may be performed at the first stage, or further augmentation or debulking can be addressed in a second stage.

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**Self-Assessment Examination follows on  
page 505.**

# Self-Assessment Examination

## Reconstruction of the Cheek

by Frederick J. Menick, M.D.

1. REGIONAL UNITS ARE DEFINED BY ALL OF THE FOLLOWING EXCEPT:
  - A) Skin quality
  - B) Outline
  - C) Resting skin tension lines
  - D) Contour
  
2. CHEEK SKIN RECEIVES ITS BLOOD SUPPLY FROM THE:
  - A) Subdermal plexus
  - B) Axial blood vessels
  - C) Vertical myofascial perforators
  - D) All of the above
  
3. WHICH OF THE FOLLOWING STATEMENTS IS FALSE?
  - A) Distant tissue is a poor-quality match for facial skin.
  - B) Skin grafts are ideal for resurfacing small subtotal defects.
  - C) A completely skin-grafted or flapped face is best for total facial resurfacing.
  - D) Microvascular flaps of distant tissue can supply bulk and oral lining and can revascularize compromised wounds.
  
4. GOOD SOURCES OF AVAILABLE EXCESS SKIN FOR LARGER DEFECTS ARE LOCATED IN ALL OF THE FOLLOWING AREAS EXCEPT:
  - A) Chest
  - B) Cheek
  - C) Jowl
  - D) Neck
  
5. DEEP-PLANED CHEEK FLAPS ARE ESPECIALLY ADVANTAGEOUS IN ALL OF THE FOLLOWING SITUATIONS EXCEPT:
  - A) Large wounds closed under tension
  - B) Deep defects
  - C) Smokers
  - D) Small-to-moderate defects in children

To complete the examination for CME credit, turn to page 595 for instructions and the response form.